WHAT IS CLAIMED IS:

1. A wireless Crest Factor reduction and amplitude pre-distortion circuit for use with multi-carrier signals in a wireless communication system to enhance the linearity and performance of the amplifier, in particular wireless cellular, PCS, wireless LAN, line of sight microwave, military, and satellite communication systems and any other none wireless applications, the Crest Factor reduction and amplitude pre-distortion circuit comprising:

   - A multi-carrier receiver for the Crest Factor reduction and amplitude pre-distortion of IF or RF input signal to amplifier. If the input signal is baseband then the multi-carrier receiver is bypassed.

   - An envelop detector that produces the envelop of the feedback multi-carrier signal from the output of the amplifier.

   - A digital signal processing block to reduce the Crest Factor of the multi-carrier input signal.

   - A digital signal processing block to limit or clip the amplitude of the multi-carrier signal.

   - A digital signal processing block that converts the amplitude clipped or limited multi-carrier baseband to baseband representative of individual carrier signals..

   - A digital signal processing block that filters the baseband representative of individual carrier baseband signals to remove unwanted signal produced due to clipping or limiting the multi-carrier signal amplitude.

- A digital signal processing block that up converts the filtered baseband representative of each carrier to its original baseband frequency.

- A digital signal processing block that pre-distort the Crest Factor reduced multi-carrier signal using a look up table.

- A multi-carrier transmitter block that prepare the Crest Factor reduced and pre-distorted multi-carrier signal for delivery to multi-carrier amplifier.

- A digital signal processing block that adaptively updates the amplitude pre-distortion look up table.

- A digital signal processing block that gain and phase adjust the inputs to the amplitude pre-distortion adaptation algorithm.

2. The Crest Factor reduction and amplitude pre-distortion circuit according to claim 1, wherein multi-carrier input signal from the wireless transmitter is sampled using sub-harmonic sampling technique at the input frequency or at an intermediate frequency.

3. The Crest Factor reduction and amplitude pre-distortion circuit according to claim 1, wherein the multi-carrier input signal from the wireless transmitter is sampled using sub-harmonic sampling technique at the input frequency or at an intermediate frequency and the digitized multi-carrier input signal is decimated to the appropriate number of samples per symbol for further digital signal processing.

4. The Crest Factor reduction and amplitude pre-distortion circuit according to claim 1, wherein the multi-carrier input signal from the wireless transmitter is baseband and is sampled using Nyquist sampling technique and interpolated to produce the baseband multi-carrier signal with appropriate number of samples per symbol.

5. The Crest Factor reduction and amplitude pre-distortion circuit according to claim 1, wherein the multi-carrier input signal from the wireless transmitter is baseband and is sampled and decimated to produce the baseband multi-carrier signal with appropriate number of samples per symbol

6. The Crest Factor reduction and amplitude pre-distortion circuit according to claim 1, wherein the multi-carrier input signals from the wireless transmitter are in bit domain and the bit domain baseband signals are up converted, combined and interpolated to produce the digital multi-carrier baseband signal with appropriate number of sample per symbol.

7. The Crest Factor reduction and amplitude pre-distortion according to claim 1, wherein the digital multi-carrier signal is amplitude clipped or limited by a limiting or clipping function. The amplitude limited multi-carrier signal is then down converted to single channel baseband signals by digital down conversion. The individual baseband signals are filtered and up converted back to their original baseband frequency before all individual baseband signals being combined again to produce the multi-carrier Crest Factor reduced baseband signal.

8. The Crest Factor reduction and amplitude pre-distortion according to claim 1, wherein the multi-carrier signal amplitude clipping or limiting can also be perform in analog domain at an intermediate frequency (IF) , radio frequency, or analog baseband before being digitized.

9. The Crest Factor reduction and amplitude pre-distortion circuit according to claim 1, wherein the peak suppressed, and pre-distorted main signal using a lookup table is digitally up converted and converted to analog domain at an intermediate frequency or the output frequency.

10. The Crest Factor reduction and amplitude pre-distortion circuit according to claim 1, wherein the peak suppressed, and pre-distorted main signal using a lookup table is converted to analog baseband signal for up convertion.

11. The crest Factor reduction and amplitude pre-distortion circuit according to claim 1, wherein feedback envelop signal from the wireless multi-carrier power amplifier is sampled using over sampling technique and the digitized feedback envelop input signal is decimated to the appropriate number of samples per symbol for further digital signal processing

12. The Crest Factor reduction and amplitude pre-distortion circuit according to claim 1, wherein the digitized main signal and feedback envelop signal are used to adaptively update the pre-distortion lookup table. The main signal samples are delayed to match the samples from the amplifier feedback input before being used by lookup table adaptation algorithm, wherein the main signal samples and the amplifier feedback signal samples are gain controlled before being used by the lookup table adaptation algorithm.

13. The Crest Factor reduction and amplitude pre-distortion circuit according to claim 1, wherein main input signal and digitized feedback envelop input signal are aligned in amplitude by automatic gain control operations prior to further processing by the lookup table adaptive algorithm which updates the pre-distortion lookup table.

14. The Crest Factor reduction and amplitude pre-distortion circuit according to claim 1, wherein the delay described in claim 1 is measured by initially generating a digital signal with high auto-correlation property, such as a pseudo random sequence used by the main signal path, and correlation of this sequence with the amplifier output feedback envelop signal by delay adjustment algorithm. The correlation window is incremented by adjusting the sampling phase in decimation block in the path of the amplifier output feedback envelop signal in T/k steps by changing the coefficients of the decimation filter in the amplifier output feedback envelop signal path, and by incrementing the delay of main input signal used by the delay adjustment algorithm by integer sample unit delays.

15. The Crest Factor reduction and amplitude pre-distortion circuit according to claim 1, wherein the gain adjustment described in claim 1 is measured by initially generating a digital signal with constant envelop property, such as a all 0s or all 1s sequence used by the main signal path, and correlation of this sequence with the amplifier output feedback envelop signal by gain adjustment algorithm. The correlation window is incremented by adjusting the sampling phase in decimation block in the path of the amplifier output feedback envelop signal in T/k steps by changing the coefficients of the decimation filter in the amplifier output feedback envelop signal path, and by incrementing the delay of main input signal used by the delay adjustment algorithm by integer sample unit delays.

16. The Crest Factor reduction and amplitude pre-distortion circuit according to claim 1, wherein the correlator could be a simple sum function which add or subtract the main signal and the feedback envelop signal to produce an error signal. The gain adjustment and delay adjustment algorithms find the value for gain and delay that minimizes the error signal.

17. The Crest Factor reduction and amplitude pre-distortion circuit according to claim 1, wherein the received signal strength of the input signal to Crest Factor reduction and amplitude pre-distortion circuit and transmit signal strength of the output from the Crest Factor reduction and amplitude pre-distortion circuit is dynamically measures to adjust the total gain of the Crest Factor reduction and amplitude pre-distortion circuit to zero

18. The Crest Factor reduction and amplitude pre-distortion circuit according to claim 1, wherein the number of carriers can be as low as one carrier.

19. The Crest Factor reduction and amplitude pre-distortion circuit according to claim 1 and subsequent claims, when it is used in wireless cellular, wireless PCS, wireless LAN, microwave, wireless satellite, none wireless amplifiers, and any wireless communication systems used for military applications.

20. The Crest Factor reduction and amplitude pre-distortion circuit according to claim 1, wherein the DSP function can be implemented in programmable logic, FPGA, Gate Array, ASIC, and DSP processor